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HUMAN CAPITAL, INNOVATION AND INTERNATIONALIZATION OF MICRO AND SMALL ENTERPRISES IN RURAL TERRITORY – A CASE STUDY

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Abstract

This paper investigates the relationship between human capital in micro and small enterprises and their respective behaviors in innovation and internationalization. Based on a case study of interpretative nature, from 2010 till 2012 we collected data about the agri-food complex of Tagus Valley (Portugal) through triangulation of techniques typically used in qualitative research: direct observation (in farms, units of processing, storage and packaging food stuffs and wines, and regulatory and promotional agents); semi-structured interviews with individuals representing the various categories of agents involved, alongside a survey with 110 business agents; and statistical data gathered in the Portuguese Agriculture Census. Survey data were object of descriptive, correlational and regression analyses. Our research provides evidence of firms making use of stable partnerships with intermediary economic agents and promoting organizations and demonstrating how effective are endogenous assets (especially those of non-mercantile nature) to the competitiveness of a rural territory, in the framework of Common Agricultural Policy. In terms of public policies for competitiveness and innovation, according to an institutional view, the state and regional/local governments, research institutions (public or private), higher education institutions and business training centers, sharing a common agenda for endogenous assets valuation, might play a strategic role in an economy strongly built on micro and small enterprises, whose sustainability depends on collaborative networking.

Keywords: human capital, innovation, internationalization, agri-food cluster

INTRODUCTION

For decades scholars have discussed the possible role of human capital as determinant of innovativeness and degree of internationalization in small and medium firms (SME). Considering contemporary territorial approaches such as local agri-food systems, industrial districts/clusters, innovative milieu, regional innovation systems, and more recently smart specialization strategies for rural territories, a central issue that remains is the causal nexus between knowledge spillovers, internationalization and clustering amongst globalized supply chains.

As shown in literature, a major argument is that through proximity, considering its spatial and non-spatial dimensions (Torre and Wallet, 2014; Boschma, 2005; Kirat and Lung, 1999), entrepreneurs and employees can take economic advantage from personal and organizational learning enhanced by access to formal (codified) and non-formal (tacit) knowledge networks. These are fed by a complex set of interactions between actors of diverse nature playing several roles in any competitive value chain – from higher education institutions and R & D centers, either public or private bodies; business associations and trade unions; trade chambers and agencies promoting international business; national and federal governments and their representatives in supranational governance institutions.

Typically, empirical studies are focused on SME dynamics considering their relevance in European economy. In fact, these are the backbone of the EU-28 economy, sustaining two-thirds of employment in 2015 and close to three-fifths of the value added in the non-financial sector (Muller *et al.*, 2016). Further strengthening its relevance in the European Community economy, SMEs (and microenterprises) account for around 99% of the European Community business structure (European Commission, 2018). Albeit, to enhance a more realistic comprehension of heterogeneity in business agents' behavior in what concerns to innovativeness and internationalization of a territorialized supply chain at a rural region (such as Tagus Valley's agri-food complex, in Portugal) we opt to focus on micro and small firms. These represent almost 70% according to the most recent Census 2011 (Statistics Portugal, 2018).

This paper aims to underpin the understanding of the triangular relationship between human capital in micro and small enterprises and their innovation performance and internationalization degree as drivers of business sustainability located at a rural territory.

Based on literature review about territorial systems of innovation and giving sequence to own research developed currently we argue that human capital contributes to boost (or limitation) of the innovation capacity of a firm; nevertheless, that does not inhibit firm's capacity to reach external markets. Stable partnerships with suppliers of raw materials and intermediate business agents and public promoting organizations should be effective to sustain agri-food supply chain competitiveness, acting from local to global scales depending on the human capital endowment. These partnerships will be the result of close business and non-business relations fed by intense social capital, having a positive effect on human capital valuation and, as such, on the ability to compete abroad.

As the major issue our purpose is to investigate if innovative capacity (innovativeness) of micro and small enterprises (mainly), side-by-side with their innovativeness and internationalization, is positively influenced by their territorial anchoring.

This paper is structured as follows: after introduction (section 1), we develop the conceptual and theoretical framework (section 2), defining human capital as well explaining theoretically the relation between innovation and territory based on territorial systems of innovation approach. The results of our research about the synergistic linkage between human capital, innovation and internationalization (simplistically based on exportation) are presented at section 3, followed by a discussion (section 4) and conclusion with suggestions for further research (section 5).

MATERIALS AND METHODS

Human capital

The modern concept of human capital has origin in the seminal work of Gary Becker (1964, 1975, 1994) in which the Nobel laureate[1] argues that there is a positive association between the level of individual's education, personal earnings and income share, technological innovations at

1 Becker was awarded the Nobel Memorial Prize in Economic Sciences in 1992 and received the United States Presidential Medal of Freedom in 2007.

organizations' level, and the sustainable economic growth. In fact:

> *"Economic analysis has no trouble explaining why, throughout history, few countries [USA and some European countries] have experienced very long periods of persistent growth in income per person. For if per capita income growth is caused by the growth of land and physical capital per worker, diminishing returns from additional capital and land eventually eliminate further growth. (...) The systematic application of scientific knowledge to production of goods has greatly increased the value of education, technical schooling, and on-the-job training as the growth of knowledge has become embodied in people – in scientists, scholars, technicians, managers, and other contributors to output"* (Becker, 1964, 1975, 1994, pp. 23–24).

Defining the concept Becker (2002, online) states that *"human capital refers to the knowledge, information, ideas, skills, and health of individuals"*. He even admits that *"This is the 'age of human capital' in the sense that human capital is by far the most important form of capital in modern economies. The economic successes of individuals, and also of whole economies, depend on how extensively and effectively people invest in themselves."*

In fact, the last decade of 20th century was marked by a clear change in the pattern of competitiveness of the economies of the Triad (USA, European Union, and Japan), pressured by trade competition exerted by BRICS[2], towards a paradigm of the 'knowledge-based economy'. This refers to a model of economy based on production, distribution and use of direct form of knowledge and information to assert that knowledge, imbued in humans (human capital) and technology, which plays a central role in economic development (OECD, 1996).

Later, also OECD (2007) recognized the existence of a linkage between individual and social well-being and human capital defining this as the knowledge, skills, competences, and attributes intrinsic to individuals that facilitate the creation of personal, social and economic well-being. It is distinguished from the labor force by the fact that it captures the human resources' quality instead of quantity, as such depending on the educational and training levels of workers. Thus, human capital is developed in the contexts of:

- Learning within family and early childcare settings.
- Formal education and training including early childhood, school-based compulsory education, post-compulsory vocational or general education, tertiary education, public labor market training, adult education, etc.
- Workplace training as well as informed learning at work through specific activities such as research and innovation or participation in various professional networks.
- Informal learning 'on-the-job' and in daily living and civic participation (OECD, 2001, p. 18).

As a corollary, we may say that human capital enrichment demands personal development through teamwork and engagement with organizational and social values. For this reason, many scientists and scholars have admitted that intangible and non-mercantile assets – such as proximity, interactive learning, relational and/or social capital, bounded rationality, institutional thickness, territorial embeddedness, and knowledge networks – are crucial to sustain dynamic and sustainable competitive advantages in globalized supply chains – see Oliveira (2013) for a survey of literature and empirical work.

Particularly for SMEs, the ability to obtain and exploit information is positively linked to the firms' human capital (skills, training, and experiences), which exerts a determinant influence in shaping absorptive capacity and determines the capability to access external sources of knowledge (Farace and Mazzotta, 2015). According to these authors, calling up the theory of industrial (Marshallian) districts, the new economic geography and the literature on networks, *"the creation of knowledge and the adoption of innovation also depend on the relations that the firm has in its surrounding and delimitated territories such that the nature and the strength of networks around the firm become very important"* (idem, p. 40).

Innovation and territory

Systems of innovation: a territorial approach

The concept of interactive learning, within an open system of knowledge flows, is at the cornerstone of micro and small enterprises' innovative performance. In the context

2 The term 'BRICS' – which refers to the bloc of emerging economies in Brazil, Russia, India, China, and South Africa – was coined years ago by Goldman Sachs analyst Jim O'Neill, who saw the countries as promising markets for finance capital in the 21st century. – cited from Rosa Luxemburg Stiftung. Published in April, 2015; accessed May, 2017: https://www.rosalux.de/en/publication/id/4047/the-brics-competition- and-crisis-in-the-global-economy/.

of collaboration, contemporary literature suggests that this type of firms faces a double challenge: firstly, it is broadly recognized their lack of internal resources in R & D activities, even though innovation activities are crucial for their survival (Acs and Audretsch, 1988; Cohen and Klepper, 1996; Rogers, 2004); secondly, their spatial agglomeration ('cluster') can work out as a source of knowledge spillovers and facilitator of effective strategic alliances (e.g. joint ventures) with other competitors to reduce business risk, including export activities or even foreign direct investment (Gu *et al.*, 2016; Lööf and Nabavi, 2015; Bjerke and Johansson, 2015; Yang *et al.*, 2014).

These concerns motivated a huge vortex of theoretical and empirical contributions around the territorial systems of innovation literature. Our paper will, nevertheless, follow through a quite short review of this. As mentioned by Morgan (1997), innovation – *sensu lato*, including not only product, process and organizational innovation in a firm but also the social and institutional nature in the sphere of an industry, region and/or nation – has assumed an ever more central role in the theories of economic development.

The innovation capacity varies whatsoever with the scale of analysis we might consider: from company to company but also from country to country and from region to region. Both at a firm and territorial level, such capacity is determined by a complex mixture of factors, internal and external to the unity of analysis, inducing (or limiting) knowledge spillover effects, which promote a significant impact on the innovation process and on localized dynamics of innovation. A territorial innovative capacity depends on institutional thickness, based on the commitment and performance of the institutions, their national culture, human capital and technological intensity (Zukauskaite *et al.*, 2017; Amin and Thrift, 1994). However, it also depends on financial resources for innovation, and the linkages and cooperation networks used to stimulate the innovation capacity (Oliveira and Natário, 2016a).

The main concern of territorial (or regional) approach has been for many decades to understand the mechanisms of interaction and cooperation among the different institutional and business actors, which should stimulate the knowledge flows necessary to generate both innovation and entrepreneurial competitiveness inside a certain region. In a broader sense, the several branches of such an approach converge to a fundamental assumption that is the existence of a circular cumulative process necessary to assure sustained regional economic growth (Fujita *et al.*, 1999; Jacobs, 1970; Hirschman, 1958; Myrdal, 1957; and Perroux, 1955).

Regions have distinct characteristics of governance and cultural characteristics that make them peculiar and unique. As such, the system of innovation at the regional level (or regional innovation system, RIS) *"allows a greater formatting and adequacy of national policies to regional contexts, since there is a higher proximity between the various actors and a greater cultural homogeneity and, also, because the intensities and the dynamics of innovation are sometimes more different among regions than among nations"* (Oliveira and Natário, 2016a, p. 1464). So, the RIS can be defined as a network of players and institutions attached to the region, directly related to the generation, distribution, and ownership of knowledge (Chung, 1999). It encompasses the set of players and organizations (companies, universities, research centers) systematically involved in the development of innovation and interactive learning through common institutional practices.

The territory: Tagus Valley (Portugal)

Consisting of two NUTS 3 statistical regions[3], Tagus Plains ('Lezíria do Tejo', in Portuguese designation; code PT185) and Middle Tagus ('Médio Tejo'; PT16I), as illustrated in Fig. 1, the Tagus Valley territory is contiguous at southwest with the Metropolitan Area of Lisbon. This groups two NUTS 3 sub-regions: Great Lisbon/'Grande Lisboa' (including Lisbon and medium-sized cities like Amadora, Loures, Odivelas and others) and Setúbal's Peninsula (at the south bank of Tagus' estuary). The Tagus Plains is part of Alentejo (NUTS2, code PT18), while the Middle Tagus belongs to Centro (NUTS2, PT16).

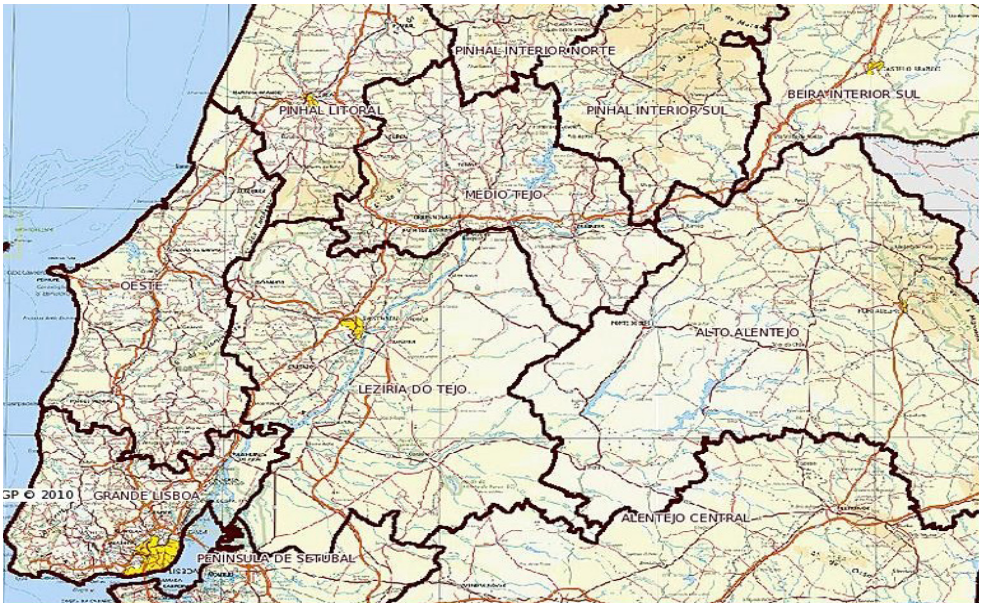
Considering its municipalities, the Tagus Valley – a region created for territorial administration purposes – includes 21 cities[4]. According to

3 See Regulation (EC) No 1059/2003 of the European Parliament and of the Council, of 26 May 2003 for further details. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:02003R1059-20180118&qid=1519136585935. [Accessed: 2018, June 13].

4 In Tagus Plains cities are: Almeirim, Alpiarça, Azambuja, Benavente, Cartaxo, Chamusca, Coruche, Golegã, Rio Maior, Salvaterra de Magos and Santarém. In Middle Tagus: Abrantes, Alcanena, Constância, Entroncamento, Ferreira do Zêzere, Ourém, Sardoal, Tomar, Torres Novas and Vila Nova da Barquinha.

the most recent census in Portugal, the population density of our geographical object of research is about 71 inhabitants per square kilometer for a total surface of 6,581 km^2; substantially lower than the neighboring Lisbon's metropolitan area (931 inhabitants per square kilometer) with territorial area about 3,015 km^2 (Statistics Portugal, 2018).

Such data reveal that Tagus Valley is a 'predominantly rural region' (OECD, 2011). With purpose of economic analysis, by applying quotients of location it is proven that this territory has a significant spatial agglomeration of agriculture and agri-food industries, evidence of specialization (and regional competitiveness) in agrobusiness activities – as shown in Tabs. I and II.



1: *Tagus Valley map and contiguous NUTS 3 regions.*
Source: Portuguese Geography Institute (2010)

I: *Location quotients of agriculture activities located in Tagus Valley (in 2009)*

Groups of agricultural activities (NACE Rev. 2, Section A)	Relative weight per group in the universe of establishments in the Portuguese Mainland (1)	Relative weight per group in the universe of establishments at Tagus Valley (2)	Location quotient by group of activities[5] (2)/(1)
A1.1 – Non-perennial crops	1.11%	2.94%	2.65
A1.2 – Perennial crops	0.62%	0.54%	0.87
A1.3 – Plant propagation	0.02%	0.03%	1.33
A1.4 – Animal production	0.53%	1.26%	2.37
A1.5 – Mixed farming	0.88%	1.22%	1.39
A1.6 – Support activities to agriculture and post-harvest crop activities	0.30%	0.42%	1.41
Total	3.47%	6.41%	1.85

Source: Own calculation based on Agricultural Census in Portugal (Portugal Statistics, 2010).
Note: The abbreviation NACE means nomenclature of economic activities in the European Community. For further details see Eurostat/European Commission (2008).

5 A value greater than 1 is an evidence of firms' agglomeration, suggesting that the group of activities is spatially concentrated in the region analysed.

II: *Location quotients of agro-industrial activities located in Tagus Valley*

Groups of food manufacturing activities (NACE Rev.2, Section C)	Relative weight per group in the universe of establishments in the Portuguese Mainland (1)	Relative weight per group in the universe of establishments of the Tagus Valley (2)	Location quotient by group of activities[6] (2)/(1)
Animal slaughter, preparation and storage of meat and meat products	0.13%	0.15%	1.20
Preparation and storage of fruits and vegetables	0.04%	0.11%	2.94
Production of animal and vegetable oils and fats	0.04%	0.12%	2.70
Dairy industry	0.07%	0.06%	0.86
Processing of cereals and legumes; manufacture of starches, and starches related products	0.03%	0.09%	3.31
Manufacture of bakery products and other flour-based products	1.45%	1.67%	1.15
Manufacture of other food products	0.09%	0.10%	1.13
Manufacturing of feeding stuffs	0.03%	0.10%	3.20
Total	1.9%	2.40%	1.28

Source: Own calculation based on data provided under request by the Office of Strategy and Planning, the Ministry of Labor and Social Security (April 2011).

Methods

Based on a case study of interpretative nature (Yin, 2014), from June 2010 until September 2012 we proceeded with collection of data related to the agri-food complex of Tagus Valley through triangulation of sources typically used in qualitative research: *direct observation* (in farms, units of processing, storage and packaging food stuffs and wines, and regulatory and promotional agents); *semi-structured interviews* with individuals representing various categories of agents involved, alongside with a *survey* with business agents; and *statistical data* processing of sources gathered in the Portuguese Agriculture Census.

The survey data were under statistical procedure through descriptive analysis, Spearman's rank-order (non-parametric) correlation tests, Kruskal-Wallis (non-parametric) tests for differences between means of groups of enterprises (distinguished by size) and regressions (linear and squared), including respective parametric tests.

The survey sample structure

The statistical units considered were companies with headquarters in the Tagus Valley operating more than 3 years (by the time they were inquired, between 2010 and 2012), regardless their size but exercising at least one activity belonging the agri-food supply chain. This means that at least one of the primary or secondary activities performed by the firm had to be classified within one of these divisions (according to Portuguese classification of economic activities, CAE Rev. 3[7]): agriculture, animal production, hunting and related service activities; manufacture of food products, beverages (including wine); wholesale of agricultural products and its derivatives. It should be noticed that farmers are eligible for our study under the requisite of being officially recognized as benefiters of European Union funding, in the framework of the Common Agricultural Policy. Shortly, this means they are supervised by producers' organizations and associations (as a mechanism of self-regulation, under rules

6 A value greater than 1 is an evidence of firms' agglomeration, suggesting that the group of activities is spatially concentrated in the region analysed.

7 The CAE-Rev. 3 is designed from the last division level of NACE-Rev. 2 (four digits, the classes).

of environment protection and efficient use of water for irrigation), to assure the best practices in compliance with the major objective of sustainable agricultural – as stated in the Regulation (EU) No. 1308/2013 of the European Parliament and of the Council[8].

The sample analyzed (representative of firms' population under analysis), as seen in Tab. III, was collected according to a non-probabilistic sampling in the case of the farmers because of the impossibility of knowing the universe of units to be inquired. We applied the 'snowball' method to the categories with a larger number and heterogeneity of economic agents acting in the 'agrobusiness' – farmers, agri-food industries and wholesalers. Concerning producers' organizations, agricultural cooperatives and wineries, the respective universes were surveyed once they could be perfectly identified by means of public documents referring to European Union's funds for agriculture and food industries.

Measurability and indexing of the variables

Firstly, we established a list of the main variables to be measured (innovation in its multiple categories, internationalization and human capital) to which variables of direct observation were identified as well as the respective items, together with score scales (binary and Likert's). Taken as a complex variable, *global innovation* is structured in five elementary dimensions: product innovation, process innovation, organizational innovation, marketing innovation and investment in innovation activities (OECD/Eurostat, 2005).

The firm's performance in each of such dimensions was measured according to the respective variables of direct observation. We scored each variable of direct observation according to a grid containing the respective items and scoring (further details see Oliveira, 2013; Annex XIII). Then we added the partial scores in order to get the total score of the concerned dimension. The value of the global performance was determined as the simple arithmetic mean of the 5 elementary dimensions.

For reasons of comparability, all values were converted into a sole conventional scale (0 to 100) and from this point on we have worked with indexes calculated on the total scores. That is, the sum of the scores p concerning the n items defined to a given innovation's dimension were rescaled overcoming this way the difficulty of working with different maximum values ($V_{Max.}$) and

III: *Sample structure by categories of agents in agri-food supply chain, and sizes of enterprises*

	Micro		Small		Medium		Large		Total	
Supplier	1	1.9%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
Producer/farmer	34	63.0%	23	56.1%	5	41.7%	0	0.0%	62	56.4%
Producer organization	12	22.2%	4	9.8%	0	0.0%	0	0.0%	16	14.5%
Agricultural cooperative	3	5.6%	2	4.9%	0	0.0%	0	0.0%	5	4.5%
Cooperative winery	1	1.9%	4	9.8%	0	0.0%	0	0.0%	5	4.5%
Agri-food industry	2	3.7%	8	19.5%	4	33.3%	3	100.0%	17	15.5%
Agri-food wholesaler	0	0.0%	0	0.0%	3	25.0%	0	0.0%	3	2.7%
Producer association	1	1.9%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
Total	54	49.1%	42	37.3%	12	10.9%	3	2.7%	110	100%

Note: The percentages along each column show the relative weights of each supply chain category in the respective size. The percentages in bottom line are relative to the weights of each size category in total sample. The 110 respondents correspond to a total rate of participation of 85% of the inquired entities.

8 This regulation establishes a common organization of the markets in agricultural products, repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007. It is published in Official Journal of the European Union Official Journal of the European Union (L 347/671) dated from 20.12.2013.

minimum ($V_{min.}$) according to the number of items for each variable and the assessment scale ascribed to it. In short, we followed two steps:

i) Find, according to its n items, the value of the i-th dimension of innovation concerning a given statistical unit observed:

$$IV_i^{obs} = \frac{V_i^{obs} - V_{min}}{V_{Max} - V_{min}} \times 100$$

ii) Convert that value into an indexed scale:

$$V_i^{obs} = \sum_1^n p \qquad p_{min} \leq p \leq p_{Max}$$

It was the same type of procedure used in the *Community Innovation Survey* (European Commission, 2006, 2008, 2010, 2012 and 2014) and the *Regional Innovation Scoreboard 2017* (European Commission, 2017), also applied to the elementary variables in order to interpret their relative importance as for descriptive statistics – specially as far as the measures of central tendency and dispersion were concerned (see next section). To make the reading of the indexed values more intuitive, we have classified the state of each indexed variable according to an ordinal scale per quartiles as follows: *very modest, modest, good* and *excellent.*

Regarding to internationalization measurement it was treated as a derivative variable that seeks to capture the degree of geographical expansion of the company's business across borders, from the strictly European market to the global market (at all latitudes, across the Atlantic, Pacific and Indian Oceans). It is measured on an ordinal scale determined by the number of options marked on the company's international sales markets (excluding the national, regional or local markets) among the following multiple choices: a) Europe; b) Africa; c) Americas (North, Central and South); e) Australia; f) Asia. Each option punctuates as a binary variable.

Still regarding internationalization, we opted to create an indicator capturing the propensity for internationalization, following the same type of construction of location quotient. For the category *x* of economic agent acting in agri-food supply chain, such propensity is calculated in the following way:

$$\text{Propensity for internationalization (exportation)} = \frac{\left(\frac{nr.\ of\ inquired\ units\ at\ category\ x\ with\ exportation}{total\ nr.\ of\ inquired\ units\ with\ exportation}\right)}{\left(\frac{nr.\ of\ inquired\ units\ at\ category\ x}{total\ nr.\ of\ inquired\ units}\right)}$$

This indicator has 0 as the minimum value, meaning that de category *x* has no sales to external markets (i.e. absence of internationalization), and it has no upper limit. Being equal to 1, *the propensity for internationalization will be neutral as the same the weight of the category in the sub-sample is the same as in the main sample.*

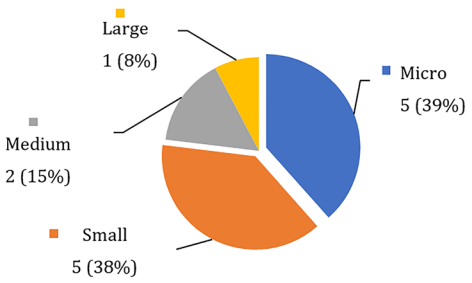
To assess the level of human capital in 110 business units surveyed, 3 indicators were used concerning either the organizational routines, or the level of academic training and/or certification of professional competence:

i) Periodicity of the internal training;
ii) Number of newspapers or scientific publications subscribed/regularly consulted;
iii) Proportion of employees with higher or vocational training courses

RESULTS

The performance of human capital

The results obtained for the set of inquired enterprises, presented in Tab. IV, allowed to infer that the periodicity of the internal training is predominantly annual (40%). The absence of internal (and external) training was detected in 14 cases. For this group, it is possible to draw



2: *Sample distribution by size of enterprise reaching the category 'excellent human capital advancement'*
Source: Questionnaire survey (June 2010 – September 2012), n = 110

IV: *Sample results for human capital performance*

Variable/item	n	%
Training of employees outside the company		
Nonexistent	46	41.8
Annual	45	40.9
Every six months	5	4.5
Every three months	9	8.2
Monthly	3	2.7
Training of employees inside the company		
Nonexistent	24	21.8
Annual	44	40.0
Every six months	11	10.0
Every three months	12	10.9
Monthly	14	12.7
Training within the enterprise is given by the firm's managerial staff		
Never	12	10.9
Few times	11	10.0
In half of cases	12	10.9
Most of the time	38	34.5
Always	13	11.8
There is no training, both inside and outside the company	14	12.7
Category in the supply chain		
Farmer/producer	12	85.7
Producers' organization	1	7.1
Agricultural cooperative	1	7.1
Size (number of employees)		
Micro-enterprise	9	64.3
Small enterprise	5	35.7
Regional market strict dependence		
Not dependent	10	71.4
Dependent	4	28.6
Competing in foreign markets		
No	11	78.6
Yes	3	21.4
Newspaper or scientific publication subscriptions		
None	40	36.4
One	27	24.5
Two or more	43	39.1
Proportion of staff employees with higher education or professional training		
Less than half	78	70.9
Half	9	8.2
More than half	19	17.3

Source: Questionnaire survey (June 2010–September 2012), n = 110

the following profile: mostly farmers/producers (86%); about two-thirds were micro-firms and the rest were small firms; only 29% sell exclusively at the regional market; almost 21% are exporters.

Based on ranking by descending order the variable 'human capital' indexed as explained in section 2.3.2, the results of our survey (Fig. 2) show that the medium and large enterprises are with greater weight (23%) at the upper quartile ('excellent' performance) compared to the inquired sample (nearly 14%). This shows that these categories of firms are the most inclined to develop their stock of human capital, according to the indicators used in our research.

It was found that the 'stock' of human capital tends to be concentrated at the medium-sized and large companies because these are the ones who most intensively promote excellence in personal development.

Innovation dynamics versus investment in human capital

The hypothetical relationship between innovation and the effort made by micro and small enterprises to rise their 'stock' of human capital remits theoretically to the functions exercised by the local environment ('milieu') in reduction of the uncertainty inherent in any process of innovation (Camagni, 1991) – see Tab. V.

These functions largely rely on the assumption that there is a proper development of human capital in the host territory of agri-food supply chain. This perspective finds support in theoretical arguments developed by regional and urban scientists – e.g. Florida (1995 and 2003), Landry (2000) and Scott (1996) – and in the evolutionist perspective of Teece (1988), when explaining the polarization effects (or urban agglomeration) of creative industries and/or knowledge intensive businesses and services. Another important contribution comes from the conceptualization of agropolitan district (Friedmann and Douglass, 1976), followed by the local agri-food system (Muchnik, 1996).

These authors recognize that the accumulation of knowledge through localized collective learning and social interaction will develop 'naturally', resulting in successive innovations. Which will lead to modernization of the agricultural sector (with growing application in commercial circuits of modern distribution) as well as of agro-industrial industries – tending this to be located at peri-urban areas to take advantage of the multiplication of family businesses (predominantly micro and small enterprises) and the infrastructures of transports, headquarters of public services, higher education

V: *The role of local milieu in reducing uncertainty inherent to the innovation process (relational synergies of knowledge)*

Function	Construct
Search	Through the informal exchange of information, the local milieu provides tracing of success stories related to the discovery of new markets and the implementation of new technologies useful to the company, and 'memorize' the channels that best disseminating these successful experiences.
Signaling	It signalizes the market in benefit of the image and reputation of local companies, acting as a sort of certifying entity of the quality of goods produced by these companies.
Transcoding	It facilitates collective learning by providing access to privileged information, which is embedded in people and transmitted by personal and organizational proximity. The mechanisms are: a) inter-organizational mobility within the region (but almost interregional immobility) of qualified human resources; b) contacts between customers and suppliers; c) imitation processes and reengineering, spread among local companies of appropriate technologies; d) effects of informal 'coffee shop'; e) provision of specialized services within the region.
Selection	It stimulates personal contacts through which are obtained efficiency/effectiveness gains in the circulation of vital information at the level of decision making conducive to innovation; in particular, through the mobility of managers in the local labor market, by imitation, cooperation actions within the framework of associations and industrial and trade organizations and complementary processes of innovation.
Control	Through 'face-to-face' ties (belonging to the same family/clan, club, associations), the local environment facilitates the sharing of relevant information in the decision-making process behind the innovation, strengthens the "ties" between the financial sector and the productive system, and promotes a similar "cultural context" among entrepreneurs, managers and other decision makers.
Transformer	It promotes positive externalities appropriable by local companies, particularly important in the spheres of labor market, human capital and education.

Source: Camagni (1991, pp. 121–144)

institutions and training centers, law and financial services, besides other stakeholders equally important to reduce costs of R & D and trading with international clients.

Stronger relations between farmers, on one side, and food industries and wholesalers on the other – through formal associations – would work then as a valuable vehicle for learning and innovation (non-market interdependencies). These are of crucial importance in a globalized agri-business world where human capital advancement is a driver of sustainable competitive advantage in any organization, regardless where it is located (Camagni, 1991 and 1995; Lundvall, 1992; Torre and Wallet, 2014; Oliveira and Natário, 2016b).

Considering the statistical results mentioned in section 3.1, the development of human capital is quite modest since most enterprises inquired were micro or small firms. This is a consequence of two main reasons: i) staff training is sporadic; ii) there is a lack of higher education among most entrepreneurs.

Therefore, we may expect modest innovative performance for all the enterprises inquired. This is a realistic expectation as it is shown by a significant and positive (non-parametric) correlation between both variables (see Tab. VI). Once that the level of human capital is modest in overall, so shall be the global innovation index (see Tab. VII).

Notice that the overall measure of innovativeness of an enterprise (global innovation index) is obtained by taking a simple average of the scores along the inputs (product, process, organizational and marketing) and output (investment in innovation activities) – following the typology and best practices for innovation data collecting and measurement, recommended by the Oslo Manual (OECD/Eurostat, 2005).

Looking at the descriptive statistics (sample's average and median) it is evident that innovation performance, in all dimensions, increases with group size.

Innovation dynamics and agribusiness' internationalization

In the first place, we base our research in a somewhat simplistic concept of internationalization, understood in a very narrow way as the capacity

VI: *Spearman's rank-order correlation coefficient between each innovation dimension and human capital advancement*

Innovation dimension	Human capital	
	r_s[(1)]	p-value
Product	+ 0.19	0.030*
Process	+ 0.36	0.049*
Organizational	+ 0.40	0.071
Marketing	+ 0.45	< 0.001***
Investment in innovation activities	+ 0.48	< 0.001***
Global innovation index	+ 0.49	< 0.001***

Notes: ***p-value < 0.001; **p-value < 0.01; *p-value < 0.05[(1)] Non-parametric correlation coefficient.

VII: *Descriptive statistics for innovation and human capital*

Innovation dimension	$\bar{x}$	median	s	x_{min}	x_{max}
Product	44.63	54.55	31.41	0.00	90.91
Process	51.26	53.85	24.20	0.00	92.31
Organizational	58.64	66.67	32.85	0.00	100.0
Marketing	38.38	44.44	34.38	0.00	100.0
Investment in innovation activities	39.59	38.75	20.66	2.50	92.50
Global innovation index	46.50	45.96	21.62	2.72	86.69
Human capital	42.17	46.15	23.48	0.00	84.62

Furthermore, the Chi-Square test (see Tab. VIII) gives statistically significant results in favor of the alternative hypothesis (i.e. existence of differences in averages of innovation performance depending on size of enterprises).

to sell systematically abroad, measured through company's variety of external markets (including also possible branches with headquarters abroad)[9]. The research proposition is: companies with higher degree of internationalization are those with better overall performance in innovation.

The degree of internationalization (see Fig. 3) is measured through an ordinal scale (Likert's type) in which the scores (from 1 to 5) are given as the enterprise exports to one or more continents – e.g. *0* means no export activity; while at the top of scale (5) reveals a global company (exporting to all continents, whatever the number of countries or diversity of products involved). Respondents were called to respond to a multiple-choice question with 5 options (see section 2.3.2), considering the first decade of new millennium.

Extracting a truncated sample according to the criterion of exporter enterprise, and then calculating the ratios of weights for each category of enterprise in both samples (last column of Tab. III, and Tab. IX, it becomes clear that farmers/producers and their organizations (including agriculture cooperatives) have less propensity to export (see Tab. X). On the other hand, agri-food companies/industries and winery cooperatives have a stronger ability to diversify markets abroad,

VIII: *Descriptive statistics for innovation and human capital, testing differences between groups averages*

Innovation dimension **Group size**	N	$\bar{x}$	**median**	**s**	x_{min}
Innovation of product					
Microenterprise	54	36.36	36.36		
Small enterprise	41	46.78	63.64	9.036	0.011*
Medium/large enterprise	15	67.88	72.73		
Innovation of process					
Microenterprise	54	45.00	46.15		
Small enterprise	41	54.78	61.54	12.491	0.002**
Medium/large enterprise	15	66.15	69.23		
Organizational innovation					
Microenterprise	54	54.72	66.67		
Small enterprise	41	62.20	66.67	2.893	0.235
Medium/large enterprise	15	65.56	83.33		
Marketing innovation					
Microenterprise	54	24.53	11.11		
Small enterprise	41	47.43	55.56	18.214	< 0.001***
Medium/large enterprise	15	61.48	66.67		
Investment in innovation activities					
Microenterprise	54	32.55	30.00		
Small enterprise	41	45.79	47.50	12.703	0.002**
Medium/large enterprise	15	48.50	52.50		
Global innovation					
Microenterprise	54	38.63	39.32		
Small enterprise	41	51.40	56.57	16.959	< 0.001***
Medium/large enterprise	15	61.91	66.96		

Notes: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

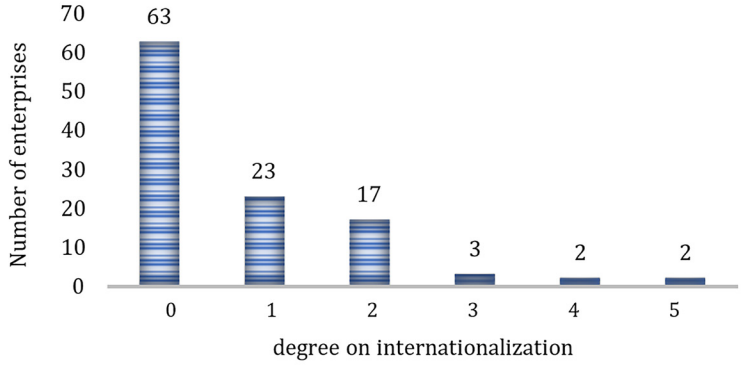
9 It is worth of notice that: "*In spite of both positivistic and instrumental research, the reliability of measuring the degree of internationalization of a firm remains speculative.*" (Sullivan, 1994, p. 325).

which can be explained (as interviews with managers, consultants and entrepreneurs shown us) by the greater complexity involved in international trade, demanding higher costs of structure to assure greater control of supply chain, avoiding risks of intermediaries' failures and/or opportunistic behaviors protecting thus intellectual property and the own trademark reputation in more demanding (and valuable) markets.

Once that agricultural activities are typically based on small structures, when compared with the downstream activities, it is intuitive to show the existence of an association between firms' size and their degree of internationalization. The explanation can be found in the type of core competence (marketing managers and sellers with a high degree of know-how, meaning more experience and expertise to negotiate in face of multicultural diversity across the world) – undoubtedly needed to get reputation in abroad markets and trust from foreigner intermediary agents.

Such reality is confirmed by experiences shared by two interviewed wine business professionals

3: *Sample distribution by enterprise's degree of internationalization*



IX: *Absolute and relative frequencies of exporting enterprises (by degree of internationalization, size and category of agent in agri-food supply chain)*

Variable	n	%
Degree of internationalization		
1	23	48.9
2	17	36.2
3	3	6.4
4	2	4.3
5	2	4.3
Size (number of employees)		
Micro (0–9)	12	25.5
Small (10–49)	22	46.8
Medium (50–249)	10	21.3
Large (≥ 250)	3	6.4
Category of agent		
Producer/farmer	23	48.9
Producer organization	6	12.8
Agri-food Industry	10	21.3
Agri-food wholesaler	2	4.3
Agricultural Cooperative	2	4.3
Cooperative winery	4	8.5
Total	47	100

X: *Internationalization performance by category of agent*

Category	QI	Propensity to internationalize
Producer/farmer	0.86	–
Producer organization	0.88	–
Agri-food industry	1.38	+
Agri-food wholesaler	1.78	++
Agricultural cooperative	0.96	–/+
Cooperative winery	1.89	++

Caption: – weak; –/+ neutral; + strong; ++ very strong[10].

XI: *Non-parametric correlation coefficient between each innovation dimension and degree of internationalization*

Innovation dimension	Degree of internationalization	
	$r_s^{(1)}$	p-value
Product	+ 0.21	0.030*
Process	+ 0.19	0.049*
Organizational	+ 0.17	0.071
Marketing	+ 0.44	< 0.001***
Investment in innovation activities	+ 0.38	< 0.001***
Global innovation index	+ 0.35	< 0.001***

Notes: ***p-value < 0.001; **p-value < 0.01; *p-value < 0.05[(1)]. Non-parametric correlation coefficient.

XII: *Results of linear regression for global innovation index*

Model specification	parameters		T-Student test for individual regressors		R-squared adjusted	Model's test	
Dependent variable: Global innovation index	β	β standardized	t	p		F	p
Constant	41.747	–	17.544	< 0.001***	0.095	12.436	0.001**
Internationalization	6.223	0.321	3.526	0.001**			

Notes: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

XIII: *Results of quadratic regression for global innovation index*

Model specification	parameters		T-Student test for individual regressors		R-squared adjusted	Model's test	
Dependent variable: Global innovation index	β coefficient	β standardized	t	p		F	p
Constant	40.267	–	15.995	< 0.001***	0.11	7.746	< 0.001***
Internationalization	12.585	0.650	3.026	0.003***			
(Internationalization)²	–1.857	–0.362	–1.686	0.095			

Notes: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

10 The symbol '+' means that the respective category has a weight in the sample of exporting companies greater than that in the main sample with a surplus below 50% (1 < QI < 1.5); '++' is the case when the positive deviation exceeds the 'neutral' value (1) by at least 50% (QI ≥ 1.5). In the case of a negative deviation but not below 50%, we admit that category as being more focused at national market (at most).

11 Their testimonies were given during two workshops, performed respectively in May 10th and 24th, 2017, at Santarém Polytechnic Institute, Higher School of Management and Technology (in the context of its First Conference on International Business).

– the president of Tagus' Wines Regional Commission (a regulatory agent with the mission of promoting the regional wines abroad); and a marketing director of a big Portuguese exporter, established at Setúbal district). Both specialists recognize the extreme difficulty for independent entrepreneurs to enter successfully international markets without enough scale of production, high quality standards, trade fairs' experience and administrative personnel able to communicate with clients in effective manner[11]. Statistically, these qualitative elements of research are corroborated by a significant correlation between degree of internationalization and innovation in its multiple dimensions (see Tab. XI).

To summarize, there is a strong dependence on the regional market for micro and small firms, deeply engaged in business relations with producers' organizations/associations – an almost inevitable consequence of scarce organizational resources, but also induced by the European Community regulation to promote market equilibrium, fair trade and the reduction of the ecological footprint of agriculture and agroindustry activities (European Parliament and Council of the European Union, 2013).

Considering the question raised at the beginning of this section, the use of linear (versus quadratic) regression analysis on the index of internationalization (originally designed) allowed to realize that the purpose-built indicator to measure innovation fits best a trend in the form of inverted parabola (see Tabs. XII and XIII).

DISCUSSION

The most common size of Portuguese enterprises reflects the tendency from all over Europe: a very significant share of SMEs. This means that the business (and territorial) competitiveness will depend greatly on the capacity of ecosystem of innovation to provide new knowledge to entrepreneurs.

In fact, as the results shown in the previous section the more involved the entrepreneurs are in the regional knowledge networks, in cooperation with higher education institutions and research and development (R & D) laboratories, through formal and/or informal relations, the better should be their ability to innovate and mainly to expand their business to international markets. Such results are in compliance with the theoretical perspectives presented in section 2.2.1, particularly RIS theoretical approach. Notice that this theoretical perspective emphases essentially the logic of collective governance exerted by political, scientific and economic institutions, inherent to the systemic view (against the strictly linear model) of knowledge creation and its transfer to production system.

Developing a broader literature review around technological knowledge creation, Öberg and Alexander (2018) connects open innovation research to the general management literature. Some of their findings are aligned with ours expressed in previous paragraphs. For instance, about how companies unable the unconstrained flow of knowledge, less formal links seem to be positively correlated with knowledge outcome, while the inclusion of multiple companies increasingly requires formal mechanisms.

In general, our results confirm that innovation is not the main driver for highest degrees of internationalization, weighing more the reputation of the wine-producing region and the management competences than enterprise innovativeness based in R & D activities. Such territorial and organizational assets, presented in detail in Tab. V (section 3.2), are mirrored in strengthening of personal and social ties with abroad trading partners. In other words, considering the greater human capital gap of microenterprises it no wonders that empirically internal practices for managing innovation be mediated by application-oriented sourcing on innovation success as it happens in SMEs (Brunswicker and Vanhaverbeke, 2015).

Thanks to the natural and cultural heritage, jointly with dense social and industrial atmosphere, we are in presence of a territorialized *system of value* (Porter, 1998) considering the integration with other value chains – such as tourism (including ecotourism and wine tourism) and forestry activities, where growing and processing of cork plays a strategic role for territory sustainability (Ferreiro *et al.*, 2015) – having the Tagus River watershed as the main natural asset.

We are led to conclude that empirical findings provide support for the theoretical hypothesis on the effect of technology, human capital and networks in knowledge transfer and absorption, which in turn significantly affects innovation in SME. In other words, the way forward is to consolidate an effective regional ecosystem of innovation, particularly in rural regions (Oksanen and Hautamäki, 2014).

Considering that the research period coincided with the austerity period imposed by Troika (European Central Bank, International Monetary Fund and European Commission) in the framework

of financial assistance requested by Portuguese Government (of which the prime-minister was José Sócrates), exposed the dramatic risk of bankruptcy like the Greece's, the main rationale for the strategic focus on exportation markets for most companies was to avoid the negative business impact of national consumers' real income cut.

As a major limitation, this research was based on data taken from a previous research, performed between 2010 and 2012, replicating some ideas drawn by then but now with a reinforcement in face of renewed qualitative information, enriched with new insights coming from recent literature. Naturally, we are motivated to go further using more recent data and enlarging the territory covered by our research avoiding the absence of generality imposed by the case study method. Then, one possible path to follow might be developing a comparative study case picking a similar Czech region to evaluate if micro and small enterprises present (or not) more openness to innovation and internationalization; if so, how relevant and dynamic may be the public institutions to provide them the needed human capital availability.

CONCLUSION

This research aimed to demonstrate that human capital is a driver of firms' innovative capacity, having also a direct influence in the internationalization considering the expertise that is embodied in international business managers and consultants.

From empirical evidence a central idea emerged: ties between individual entrepreneurs (especially farmers) and sectorial organizations and social relations inside the rural communities of Tagus Valley are crucial as sources of tacit knowledge, which is vital to run their business according to standards of quality and trading requisites imposed by Common Agricultural Policy concerning to products' certification and safety food legislation. The implementation of such standards has been a hard challenge for most enterprises, particularly those of smaller company size, considering the demanded investment in innovation activities.

The greater complexity for entrepreneurs wishing to extend their business to an international scale, facing higher costs of structure to assure greater control of respective supply chain (as trade-off of neutralizing risks of intermediates' failures and/or opportunistic behaviors, as well as of protecting their intellectual property and the own trade mark reputation), enhances microenterprises and SME agglomeration in 'agropolitan districts'. Such poles of regional and sectorial competitiveness enhance reduction of transaction costs by fostering knowledge transfer and rising effectiveness of managerial decisions.

Finally, we may conclude there is a territorial dependence for agri-food supply chain sustainability at the level of agricultural activities, especially in what concerns to the regional business ecosystem, because of the lack of human capital development in micro and small firms, helping them to resist competitively in regional market. For future research, we suggest a larger study considering the national range of such types of firms, focusing also on other industries and services (besides the traditional sectors); as well as to use more robust indicators about human capital, innovation and internationalization.

In terms of public policies for competitiveness and innovation, according to an institutional view, the state and regional / local governments, research institutes (public or private), higher education institutions and business training centers, sharing a common agenda for endogenous assets valuation (especially related with agri-food and forestry activities), might play a strategic role in an economy strongly built on micro and small enterprises, whose sustainability depends on collaborative networking. In other words, the way forward is to consolidate an effective regional ecosystem of innovation particularly in rural regions in order to succeeded well in international markets.

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